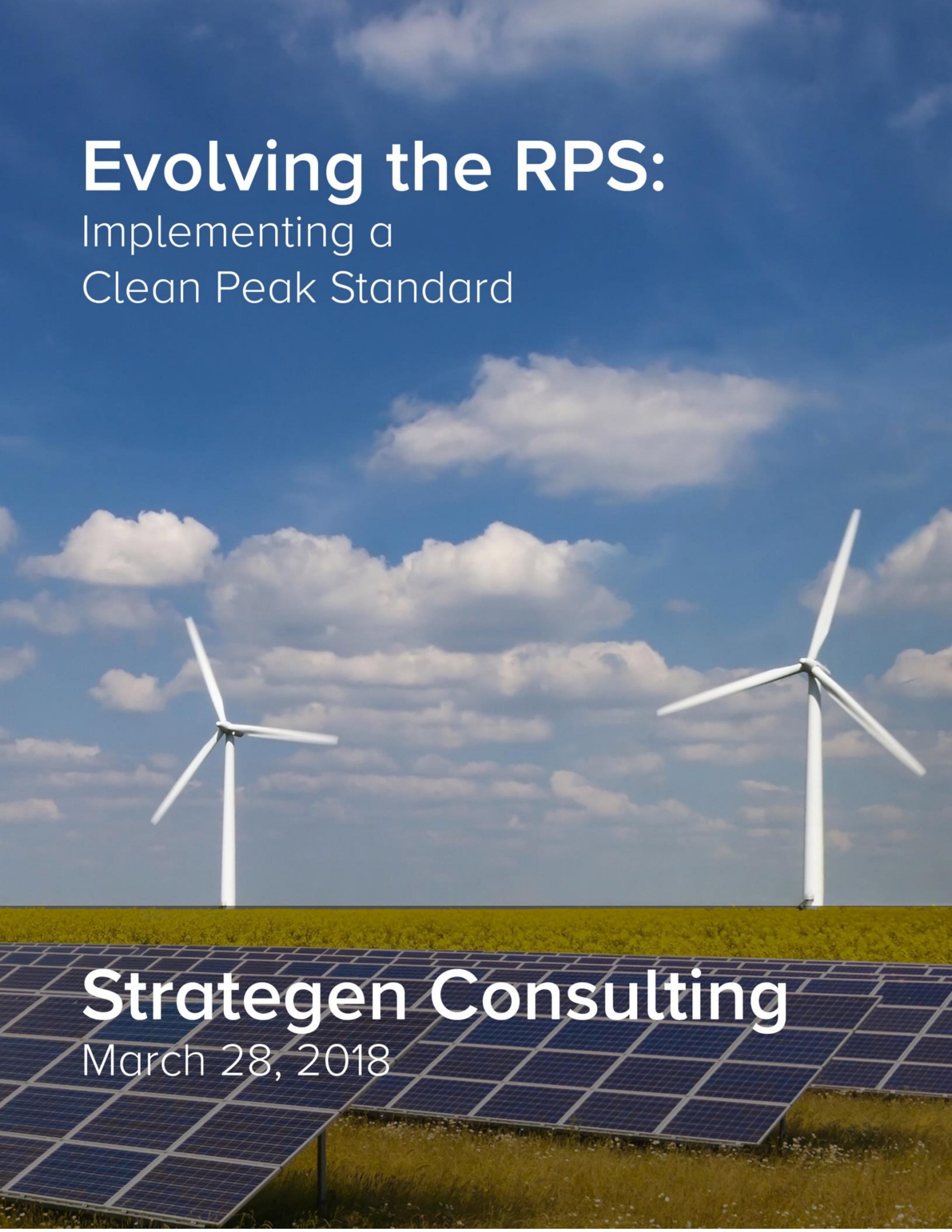
Evolving the RPS:

Implementing a Clean Peak Standard



Strategen Consulting

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Implementing a Clean Peak Standard

Policy Objectives

- Increase the share of clean energy resources and decrease the share of polluting resources that are used to provide energy during times of peak demand.
- Lower energy bills over the long run by reducing peak demand in the highest cost hours
- Limit future reliance on fossil fuel resources for meeting system reliability needs.

Policy Options & Why a Standard Is Needed

There are several potential policy options for achieving these objectives, which may include the following: 1) discrete planning and procurement steps focused on peak demand, 2) a moratorium on new peaking power plants or phase out of existing ones, 3) a time-of-delivery multiplier for RPS resources that increases compensation for clean energy delivered during peak times, 4) an RPS carve out that requires a portion of compliance to be met by resources delivering energy during peak times, 5) a Clean Peak Standard that sets a new, parallel target for delivering clean energy during peak times. While each of these has pros and cons, we believe the Clean Peak Standard creates the strongest assurance that the policy objectives will be met and sends a clear market signal to investors.

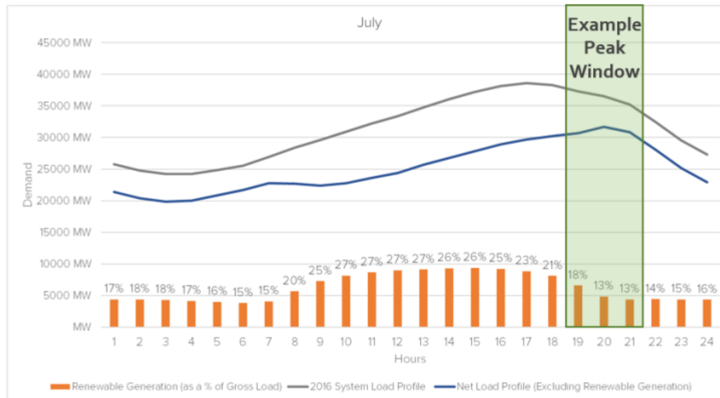
Peak Time Window Selection

Establishment of a Clean Peak Standard requires selection of a peak time window as it relates to hourly system demand. The peak window represents a discrete number of hours in the year corresponding to times when system reliability is most challenged. This could correspond to either periods of high demand (e.g. 4-8pm, weekdays, June-Sept) or of high flexible ramping needs (e.g. 6-9pm, weekends, Feb-Apr). In either case, it should be clear what system reliability issues are being targeted and it may differ by utility. Since the peak of hourly net load reflects the time period when the greatest amount of conventional resources are likely to be dispatched, we highly recommend setting a peak window that corresponds to this.[1]

[1] Other potential bases for establishing this window include (a) hourly gross load and (b) hourly load within a local capacity zone.

- The clean peak standard is partly intended to help address emerging operational challenges associated with meeting electric power demand, net of renewable resources

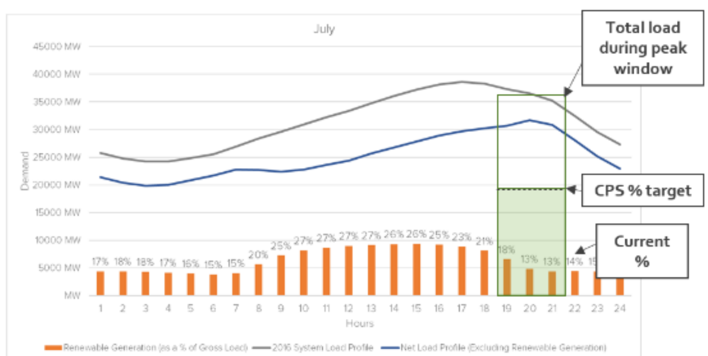
- Thus, the net load curve is used as the basis for establishing the peak window.



The net load shape may change as load patterns shift and as new renewable resources enter the market. It is advisable to model the peak period under different scenarios over 10-20 years to project how the peak may shift over time. It may also be necessary to adjust or expand the peak window as time goes on (see "Compensation" section below for key considerations). Changes to the initial set of clean peak hours should be limited to only one or two hours in either direction from the originally set of hours. For storage-only resources, hours may change without limit if necessary.

- For compliance purposes, qualifying energy produced during the peak window would be measured against the total or gross load during that "head of the duck" peak window.

- Measuring compliance relative to gross load (rather than net load) is necessary to properly account for existing renewable resources and avoid double counting.



Targets and Timelines

There are two methods to set a Clean Peak Standard. The first, "baseline method" involves determining the current level of eligible resources during the peak window for each relevant jurisdiction and then setting a yearly incremental increase from there (i.e. 1.5% increase per year). The second, "future target method" is simply setting a date for meeting an initial Clean Peak Standard target in the same manner as an RPS (e.g. 25% by 2025) and may also include interim steps. The latter requires a net load peak time window. Because system needs are constantly evolving, it may be advisable to set a modest initial target that is close to today's date with the intention of including additional increases beyond that. Additional increases to both methods can be accomplished in one of several ways: 1) increase the magnitude of the target (e.g. from 1.5% to 2% per year or increase to 30% by 2030) without any change to the peak time

window, 2) increase the size of the peak window (e.g. increase from 4-8pm to 4-9pm by 2030) without any change to the target, or 3) increase both the target and the peak window.

Obtaining Clean Peak Credits

Clean Capacity Credits or Clean Peak Credits are just like renewable energy credits (REC) except they are only awarded for metered output during the designated Clean Peak window (not at any hour of the day like RECs). If a Clean Peak eligible resource still produces RECs, however, during the peak window, those RECs are "upgraded" to Clean Peak Credits. For simplicity, any generation during the peak window counts as a Clean Peak Credit. It is highly advisable to use a net-load time periods because as standard clean energy penetration increases, certain hours within the peak period may receive a disproportionate share of output. If this is projected to occur, it may be advisable to award Clean Peak Credits by "prorating" deliveries for the peak window, perhaps based on average hourly production over each peak period hour.

CPS and RECs

To avoid double counting, RECs and Clean Peak Credits must stay "bundled" together when the clean generation resource is a newly built resource. In other words, it should be required that Clean Peak Credits cannot be issued to new generation resources unless RECs have been retired for the RPS compliance. It should also be made explicit that Clean Peak Credits do not represent or convey generation attributes. Rather, they are a state compliance mechanism only. This will help to avoid disaggregation of RECs with respect to established REC and certificate definitions in state law, tracking system rules, and the voluntary market.

Compensation

Compensation should be set at a fixed level for 10-20 years depending on comparable REC contract length in the state. Auctions or market-based mechanisms (i.e. step downs) should be employed to minimize costs to ratepayers. If fixed incentive payments are employed (i.e. no auction), downward adjustments can be made to reflect other potential revenue streams such as wholesale market participation or compensation for distribution level services such as non-wires alternative. If a completely new peak period (representing a 3+ hour shift) emerges due to the success of the Clean Peak Standard, some form of time-period grandfathering should be initiated for resources that produce during the original window to avoid a snap back in demand for those hours and provide market participants with a reasonable degree of operational certainty. For Clean Peak Standards that set a baseline and incrementally step up from there, incremental peak coincident energy efficiency and demand response savings may qualify if measurement and verification can occur on an hourly basis. Since load reducing demand side resources are usually administered through separate programs, avoided Clean Peak Credits should be incorporated in any cost/benefits calculation or screening. If those separate utility-level programs already compensate peak demand reductions, then it may not be prudent to award additional compensation through a Clean Peak Standard.

Eligible Resources

Typically, generation resources that qualify for the Clean Peak Standard would include the same resources that qualify for a Renewable Portfolio Standard, as well as other zero carbon resources a state wishes to include. Demand side resources such as energy efficiency, demand response, and demand management can also indirectly help to achieve a Clean Peak Standard by reducing the peak load. Accordingly, avoided

Clean Peak compliance costs should be incorporated into any cost-effectiveness evaluations performed as part of implementing demand-side resource programs. It is possible to establish a baseline for tracking incremental demand-side resource contributions as eligible resources, provided that there are sufficient measurement and verification processes to track peak time window savings. Several states and ISOs have successfully implemented M&V rules that could be used as a model. However, for simplicity, we recommend limiting initial eligibility to generation and thermal resources that are directly metered. This is in line with the standard RPS model of eligible resources. Incorporating additional "non-generating" demand side resources can occur once the core of the Clean Peak Standard is up and running. Regardless, eligibility should only apply to new incremental DR and EE measures.

Standalone storage

States should ensure and encourage standalone storage resources' eligibility and participation in Clean Peak Standards. Standalone storage can be sited in constrained load pockets in order to provide local capacity and reliability services. Strategically placed storage can avoid local fossil unit starts, which produce criteria pollutants (ozone, PM, NOx, etc.) usually in dense disadvantaged communities. Avoiding the startup of these fossil units would lead to cleaner air in urban centers and improved health for many nearby residents. To meet the policy objectives the Clean Peak regulations could require either "virtual pairing" through timed REC exchange or storage charging during pre-selected hours when cleaner, more efficient generation is more likely to be on the margin. More on this second case in the following section.

What is "clean" when it comes to energy storage?

(This section was largely borrowed with permission from the Stem, Inc. blog post "What is 'Clean' in a Clean Peak Standard?")[2]

Any implementation of a Clean Peak Standard will need to decide how much of the electricity discharged from energy storage during a Clean Peak Window qualifies for Clean Peak Credits. Unfortunately, the intuitive answer, is not always correct. If that storage is either added to an existing renewable generator ("retrofit") or is added standalone to the mix of existing generators on the grid, it doesn't meet the Clean Peak objectives unless the storage is charged when cleaner resources are on the margin. However, a new renewable asset that is built and is enabled by storage will directly meet the Clean Peak objectives. The idea is that to the extent the renewable generator would not have been built without the energy storage, the storage device should get credit for the emissions reduction caused by the new renewables displacing fossil generation.

This is known in GHG calculations as the "build margin", as opposed to the "operating margin" that was described in the retrofit scenario. And if the energy storage is shifting energy from renewable production times to peak, then it should get full credit in the Clean Peak Standard.

If storage qualifies for Clean Peak Credits based on this "new build" concept, it's also true that physical pairing is not necessary, hence "virtual pairing" though timed REC exchange. A new renewable generator could contract with a storage installation somewhere else to shift energy on the grid from times when the renewable generator is producing to the Clean Peak Windows and thereby satisfy the Clean Peak

[2] http://www.stem.com/clean-clean-peak-standard/

requirements. It should be noted that REC exchange is not needed if the storage is charging during times of clean resources on the margin.

The bottom line is that how energy storage counts as a clean resource for the Clean Peak Standard depends only on **when** the energy storage was charged not whether the energy storage is located with renewable generation. So, standalone energy storage must be given equal Clean Peak Credit as storage physically paired with renewable generation.

This results in the following recommended set of rules for awarding Clean Peak Credit to energy storage resources.

Note that in all cases, the term "standalone storage" includes both single installations and aggregations of installations, e.g. an aggregated fleet adding up to a 1 MW resource is treated the same as a single 1 MW installation. For a storage resource that discharges 1 MWh during a Clean Peak Window, the resource gets up to 1 MWh credit, depending on how "clean" the charging energy was.

CPC = Clean Peak Credit

CPC awards = Clean Peak Credits measured on monthly cycles

Peak Discharge = total KWh of energy discharged by storage during Clean Peak Windows in the month

Clean-Margin Charge = total KWh of energy used to charge storage that occurred during times of clean resources on the margin in the month

Renewable-Paired Charge = total KWh energy used to charge storage in the month that occurred when a (physically or virtually) paired, new build renewable generator was producing more KW than the charging KW of the storage

	Co-located w/ Renewables	Standalone Storage
Retrofit / Existing Generators	CPC = Lesser of (Peak discharge, Clean-Margin Charge)	CPC = Lesser of (Peak discharge, Clean-Margin Charge)
New Build of Renewables	CPC = Lesser of (Peak Discharge, Renewable-Paired Charge)	CPC = Lesser of (Peak Discharge, Renewable-Paired Charge)

Example Calculations

- Storage is retrofitted to existing renewable generation or added standalone to the grid:
  - Peak Discharge is 10 MWh; Clean-Margin Charge is 6 MWh = **only 6 of the 10 MWh discharged was clean so earns CPC of 6 MWh**
  - Peak Discharge is 10 MWh; Clean-Margin Charge is 12 MWh = **all of the 10 MWh discharged was clean so earns CPC of 10 MWh**

- Storage is enabling the build of new renewable generation:
  - Peak Discharge is 10 MWh; Renewable-paired Charge is 7 MWh = **CPC of 7 MWh**
  - Peak Discharge is 10 MWh; Renewable-paired Charge is 13 MWh = **CPC of 10 MWh**

State Specific

Ultimately each jurisdiction that looks to implement a Clean Peak Standard has unique system attributes, policies, and goals. This guide is meant to a helpful resource and not overly prescriptive. Some deviations, additions, or modifications may need to be made to account for the natural diversity that exists between utility services territories, balancing authorities, states, and countries. Such changes are acceptable so long as the core intent of the Clean Peak Standard remains intact.

Strategen Consulting

2150 Allston Way, Suite 210

Berkeley, California

94704